

had been completed before it was deposited. Nor again do the members of the Oolitic group of the rocks cropping out in succession further east show any such folds as those visible in the Carboniferous, and it is not until we have passed over a considerable tract of Secondary rocks in which there are no signs of east and west folding that we reach the anticlines of the Vales of Pewsey and Wardour. Nor can we then fit these folds in the Cretaceous formation on to any visible axes in the Carboniferous rocks. In these circumstances it would be unjust to suppose that such synclines and anticlines as those of the London and Hampshire basins, or of the Weald, coincide with previously formed synclines and anticlines in the older rocks. They give a clue to the position of the old axis, but not necessarily to the details of its structure. Yet it is upon the determination of the position of the older anticlines and synclines, and of their intersection with the north and south disturbances, that we must depend for locating concealed coal-fields. So far but little has been done in the forty-eight years since the question was first mooted by Godwin-Austen. The existence of a coalfield in Kent has been proved, and what appears to be a prolongation of a disturbance from the Pas de Calais along the south-western side of it. The other borings which have reached the Palæozoic floor round London and at Harwich have thrown but little light on the details of its structure. By far the greater part of the ground remains yet to be explored.

In this brief review of the earth-movements of one period, as manifested in one small part of the globe, we have found reason to conclude that they were the result of compression and upheaval; that the crust yielded to the compression by overthrusting and buckling along certain belts; that these belts in the north of England and the Midlands ran for the most part north and south, diverging, however, to the south-west and to the south-east, while in the south of England they took an east and west direction and concentrated themselves along a belt of country which presents the phenomena of crushing on a stupendous scale. We have touched in two cases the flanks of a mountain-range, the Caledonian, which was built and ruined before the Carboniferous period; the Armorican, which was built after that period, and which, though it has stirred so recently as the late Tertiary period, and so energetically as to initiate the physical features and river-system of the south of England, yet expended the greater part of its energy before the Permian period. Lastly, we have found evidence, in the majority of cases, that the disturbances were but renewals of movement along lines of weakness long before established, and that in several cases there has been further renewal along the same lines during successive periods later than the one we have considered. With such a history before us, and with the knowledge that mountain-ranges have been built in other parts of the world by the upheaval of strata of almost recent date, we have more cause to wonder that the internal forces have left this quarter of the globe alone for so long, than reason to believe that they have ceased to exist. Changes of level, however, have taken place in comparatively recent times, and are now in progress. Though almost imperceptibly slow, they serve to remind us that a giant lies sleeping under our feet who has stretched his limbs in the past, and will stretch them again in the future. Nor in view of the fact that the structures I have described have only been revealed by the denudation of vast masses of strata does it seem unreasonable to suppose that they are deep-seated phenomena. The slow changes of level may be the outward manifestation of more complicated movements being in progress at a depth.

It is interesting to speculate on what appearance the globe would have presented had it not been enveloped in an atmosphere and covered for the most part with water. Owing to those circumstances it possesses the power of healing old wounds and burying old scars. In their absence we may suppose that the belts of crushing and buckling would have given rise to ridges growing in size at every renewal of movement, for they would have been neither levelled by denudation nor smoothed over by sedimentation. This globe, we may suppose, would have appeared to the inhabitants of another planet as being encompassed in a network, and we are prompted to ask whether our astronomers can distinguish in any other planet markings that may be attributable to this cause. I must remind you, however,

how much more remains to be done than I have been able to touch upon to-day. The map [appended to the address] represents one episode only in a long series of events, and a series of such maps would be required to illustrate the first appearance of lines of weakness in the earth's crust, the subsequent renewals of movement along those lines, and the formation of new lines in successive geological periods. With the case thus set out we shall be justified in appealing to the physicists for an explanation of the restlessness of this globe.

NOTES.

THE Antarctic relief ship *Terra Nova* arrived at Plymouth on Sunday night last, and afterwards left for Sheerness. It will be remembered that the *Terra Nova*, in company with the *Morning*, was engaged in the expedition for the relief of the *Discovery*, which was ice-bound in the Antarctic Sea. The two relief ships left Hobart together, and first encountered pack ice on January 4. They saw the mast-heads of the *Discovery* on January 8, and the crews of the three ships were engaged from that time until February 14 in blasting a passage through the 12 miles of ice which lay between the *Discovery* and open water. When they got within two miles of the *Discovery* the ice began to break up freely, and the task was quickly completed. The *Discovery*, having been supplied with coal by the *Terra Nova*, began her homeward journey, the two vessels during the early stages travelling in company. Subsequently the vessels parted owing to bad weather, but met again at the Auckland Isles. Thence they proceeded to Lyttelton and home.

THE first instalment of specimens collected by the National Antarctic Expedition in the *Discovery* has, according to the *Times*, arrived at the British Museum (Natural History). It consists of the collection of sealskins obtained by the expedition in the pack ice and in McMurdo Strait in the Polar summers of 1901-2, 1903-4. It is proposed to await the arrival of the *Discovery* before dealing with this instalment, which has been sent on ahead in order to ensure the proper preservation of the specimens; but the report which has been received with the collection indicates that the four species of true seals known to occur in the Antarctic are all represented. It is probable that the collection also contains one or more specimens of the elephant-seal from McMurdo Strait, a region where it was not hitherto known to exist. The remainder of the specimens collected by the expedition are coming home in the *Discovery*. On the arrival of the *Discovery*, the natural history specimens will be sent to the Cromwell Road Museum to be worked out, the trustees of the British Museum having, says the *Times*, undertaken the classification, description, and publication of the biological and geological results of the expedition.

WE much regret to have to announce the death, in his seventy-fourth year, of Dr. J. D. Everett, F.R.S., for thirty years professor of natural philosophy at Queen's College, Belfast.

WE note with great regret the death of the Rev. Dr. H. P. Gurney, principal of the Durham College of Science, Newcastle-upon-Tyne, which occurred on Saturday last through a fall while climbing in the Alps. Dr. Gurney, who did much to further the interests of science and education, became principal of the Durham College of Science in 1894, and was also professor of mathematics and lecturer in mineralogy in the same institution. In Newcastle he was a recognised leader in educational matters, and was a co-opted member of both the Newcastle and the Northumberland education committees, being particularly useful on the higher and other sub-committees.

It was arranged some time ago to promote a public memorial to Sir Thomas Browne, the author of "Religio Medici," and the executive committee to which was entrusted the work of carrying out the scheme has commissioned Mr. Henry Pegram, A.R.A., to make a statue for erection in the Haymarket, Norwich.

It is the intention of the Senate of the University of Heidelberg to establish a gold medal in honour of Prof. Kuno Fischer, and to award the same every five years for work on the history of philosophy in Germany.

ACCORDING to the *Journal* of the American Medical Association, the sum of 500*l.* has been placed with the authorities of the University of Heidelberg to award a prize every three years for the best therapeutic achievement during the previous three years published first in German literature. The donor is Prof. Czerny, and the gift is in honour of the clinician Adolf Kussmaul, on whose birthday the prize is to be awarded.

A MOVEMENT is on foot in Bombay, according to the *Pioneer Mail*, to provide a memorial to Mr. J. N. Tata, the munificent donor of the research institute in India, and a preliminary meeting to further the object was recently held, at which a provisional memorial committee was formed. It was resolved to call a public meeting to decide as to the best way of perpetuating the memory of Mr. Tata.

THE title of *grand officier de la Légion d'honneur* has been conferred upon M. Tillaux, president of the Paris Academy of Medicine. Prof. Blondlot, well known for his researches with *n-rays*, has been promoted to be *officier*, and M. J. Liégeois becomes *chevalier*.

ACCORDING to a Reuter telegram of Sunday last from Athens, violent and repeated earthquake shocks have been felt in the island of Patmos, causing severe damage. Several houses were destroyed in the villages.

THE Alexandria correspondent of the *Daily Chronicle* reports that a severe earthquake, moving in a north-westerly direction, was felt at Suez early on Monday morning last.

THE sixth International Zoological Congress opened at Berne on Monday last under the presidency of Prof. Studer, of Berne. The next congress will be held at Boston, Mass., in 1907.

THE annual meeting of the Association of German Men of Science and Medical Practitioners is to be held this year at Breslau from September 18 to 24.

THE department of medicine (under the chairmanship of Prof. Osler) of the forthcoming International Congress of Arts and Science which is to take place in connection with the St. Louis Exposition from September 19 to 25, is to be divided into the following twelve sections:—Public health, preventive medicine, pathology, therapeutics and pharmacology, internal medicine, neurology, psychiatry, surgery, gynaecology, ophthalmology, otology and laryngology, and pædiatrics. According to the *British Medical Journal* the following English medical men will take part in the proceedings, viz.:—Major Ronald Ross, C.B., F.R.S., in the section of preventive medicine; Sir Lauder Brunton, F.R.S., in that of therapeutics and pharmacology; Prof. Clifford Allbutt, F.R.S., in that of internal medicine; and Sir Felix Semon, C.V.O., in that of otology and laryngology.

THE New York Board of Health has voted the sum of 2000*l.* to defray the expenses of a commission of experts whose duty it shall be to inquire into the prevalence of pneumonia, and to suggest means of checking the evil.

ACCORDING to the *Westminster Gazette*, the formation of a National League for Physical Education and Improvement has been suggested, the object of which is to render assistance to all the bodies at present working for the health of the people to extend the benefits of training throughout the country. The movement is the outcome of the recently issued report of the committee on physical deterioration, upon which we commented last week, and it has, we understand, the support of many influential medical men and others.

AN exhibition of mineral products and hydraulic machinery is to be held in Barcelona next month, and the time for receiving applications for space from intending exhibitors has been extended up to August 31. Exhibits themselves coming from abroad will be received even after the exhibition has been opened.

It is reported in *Engineering* that the Government has decided to establish a wireless telegraph station on the Marsden, about three miles from South Shields. The station, which is to be primarily used for securing communication with passing warships, will be erected on the edge of the cliffs, which command a view north and south for miles along the coast.

It is stated in the *Engineer* that experiments with electric motive power are to be carried out on the State railways of Sweden, and that to cover the cost of the same the sum of 23,500*l.* has been granted. The experiments are to be begun at the beginning of next year.

DR. MAX UHLE, who for some months past has been carrying on archæological explorations on the coast of Peru for the department of anthropology of the University of California, has, says *Science*, made new excavations at Ancon, in several parts of the so-called necropolis, with the view of determining the relative ages of the cultures represented by the different kinds of mummies and objects. After abundant material for this purpose had been obtained, excavations were made a short distance south of Ancon. Here, in a hitherto unsuspected deposit free from mummies, remains of an early culture distinct in character from any other in Peru were found. After completing his investigations at this spot, Dr. Uhle proceeded northward along the coast towards Supe or beyond.

M. DOUMERGUE, the French Colonial Minister, has just sent, as a circular letter addressed to the governors of the different French colonies, a note drawn up by the Minister of Public Instruction pointing out the special interest attached to the study of the properties of radio-active substances. The governors are invited to undertake inquiries with a view to the discovery in the French colonies of mineral deposits containing radium. It is hoped that the governors will be able to secure the interested assistance of travellers and engineers, and in this way succeed in finding such mineral veins.

THE Port Erin Biological Station has been more fully occupied by students during 1904 than in any previous season. Thirty-two workers have occupied tables since Easter, and at times the accommodation and resources of the institution have been severely taxed. The aquarium attached to the institution is becoming increasingly popular with the public. On one day last week (the record so far) 486 visitors were admitted.

WIRELESS telegraphy is now being turned to practical use for weather forecasting, and if advance is to be made in our knowledge of the law of storms, it is probably in this

direction that we must look. The *Daily Telegraph* has made the first venture in the direction, and its enterprise promises success in the future in affording information of the approach of bad weather. Disturbances are always traversing the Atlantic, and they follow a course from W. to E., or perhaps more often from S.W. to N.E. These storm areas exert a considerable influence on our weather, and if in the summer months they do not actually occasion gales of any strength they are the cause of the rains and unsettled weather which we experience. In the winter, when our coasts are often swept by severe gales, wireless telegraphy will probably be of considerable value in giving early intimation of the approach of storms, and as Marconi's system is improved, and the messages can be sent at greater distances from our shores, the advantage will be much enhanced. The Meteorological Council was some time since in correspondence with Lloyd's with respect to taking advantage of wireless telegraphy, but up to the present it has not been found possible to conclude any arrangements.

ACCORDING to the *Lancet*, a paper was recently read before the Paris Academy of Medicine by MM. Raymond and Zimmer on the results of the application of a tube of radium containing five cubic centimetres to various patients suffering from nervous affections. In hysterical cases the results were *nil*, and the same was the case in musculo-spiral paralysis and acute facial neuralgia. Very remarkable results, however, were obtained as regards the painful phenomena of tabes. Peripheral pains were rapidly and completely relieved, and in several grave instances of gastric crisis great relief was obtained. These results induced the observers to try the effects of X-rays, and they consider that they met with great encouragement. These results are to be communicated at some future meeting of the academy.

We have received from Messrs. Brewster, Smith and Co. the following pieces of apparatus, which will be found exceedingly useful by workers in chemical laboratories:—A self-lighting Bunsen burner for lecture table use, in which a two-way cock first directs a stream of gas on some black platinum, which, becoming heated, raises the temperature of some fine platinum wires sufficiently for these to ignite the gas from the burner itself. A burette holder with a new form of screw-clamping arrangement which is easily and quickly adjusted, and is a decided improvement on the older forms. A small turbine motor, which may be worked from the usual high-pressure water supply at from 2000 to 4000 revolutions per minute, will be found very efficient in stirring and agitating operations. A circular wire which may be adjusted by a screw to the desired size acts very effectively in fastening a connecting tube on to a high-pressure water tap. An improved cheap form of Ramsay burner, with two forks for supporting the combustion tube at various heights above the burner, gives a very uniform flame along its entire length.

ACCORDING to some experiments on the formation of ozone at high temperatures by Mr. J. K. Clement, published in the *Annalen der Physik*, vol. xiv. p. 334, no trace of ozone is formed when pure oxygen is passed over the conducting substance of a Nernst lamp electrically heated to a temperature of 2000°–3000° C. When a trace of nitrogen is present, however, the issuing oxygen liberates iodine from potassium iodide solution, and the author believes that most of the recorded observations of ozone formation at high temperatures are in reality due to the formation of small quantities of oxides of nitrogen.

"THE Geology of the Country around Kingsbridge and Salcombe" is the title of a memoir issued by the Geological Survey in explanation of the new series geological maps 355 and 356. In it the author, Mr. W. A. E. Ussher, has fully described the rocks of this difficult area. In the northern part there is no doubt about the Devonian age of the slates and grits, which are grouped with the Dartmouth slates and the Meadfoot and Looe beds. In the southern part of the area there is a tract of highly altered sedimentary and basic rocks, of mica schists and quartz schists, together with green or hornblende-epidote schists. Much controversy has arisen concerning the age of these metamorphic rocks, and although the author appears inclined to regard them as altered Devonian, he has refrained from expressing any definite opinion with regard to them. His careful and detailed record of facts will greatly aid further research. There are brief descriptions of the New Red rocks of Thurstlestone and Slapton, and of the Pleistocene and recent deposits.

DR. J. A. UDDEN contributes an essay on the geology of the Shafter Silver Mine district, in Presidio County, Texas (*Bull. Univ. Texas*, No. 24). The district is composed of Carboniferous with possibly Permian rocks and Lower Cretaceous strata, the whole being invaded by intrusive bosses, dykes, and sheets of various igneous rocks including granite, diorite, andesite, and rhyolite, while extensive lava flows have covered about one-third of the land. The mineral deposits, comprising argentiferous galena, &c., occur in the Cibolo limestone, which is probably of Permo-Carboniferous age, and the Shafter Mine, the only successful silver mine in the State, has been profitably worked for nearly twenty years. In the present report attention is mainly directed to the Carboniferous and Cretaceous strata and their fossils, of which detailed records are given.

IN reference to the paragraph in our issue of July 28 with regard to recent captures in England of examples of the striped hawk-moth (*Deilephila livornica*), Mr. F. H. Perry Coste writes to us from Polperro, Cornwall, stating that one of these insects was captured near that village on August 1. Its wings were so rigid that good setting was impossible, and this leads the writer to believe that, like all British members of the species, it was a migrant from the Continent. Our correspondent would be glad to hear whether any of the other recently taken specimens were in the same condition, and whether they were captured near the shore.

A REMARKABLE instance of protective resemblance is described by Mr. L. J. Cole in a paper on pycnogonid arachnida published in vol. xxxi. (pp. 315–328) of the *Proceedings of the Boston Natural History Society*. The pycnogonids in general are long-bodied, long-limbed, spider-like creatures, somewhat recalling the stick insects in their fantastic contour. The form in question (*Anoplodactylus insignis bermudensis*) has this irregular bodily contour specially developed, and is further remarkable for its coloration of mingled pink and yellow. It thus corresponds very closely, both in form and colour, with a hydroid zoophyte (*Obelia marginata*) of common occurrence in the Bermuda sea, among the branches of which it lives. A coloured plate illustrates the striking resemblance between the two organisms.

THE *Irish Naturalist* for August contains two botanical papers of considerable interest, the one, by the Rev. H. W. Lett, recording a new species of liverwort (*Adelanthus dugortiensis*) from Dugort, in the Island of Achill, and the

other, by Mr. C. Reid, announcing the discovery in the "elk-marl" of Lough Gur of remains of the submerged flowering plant *Naias marina*. The new liverwort, curiously enough, appears to be very similar to a species from Tierra del Fuego. The *Naias*, we may remind our readers, is now found living only in one spot in Great Britain, namely, Hickling Broad, but has been found fossil in several localities, although it was hitherto totally unknown in Ireland.

SEVERAL pamphlets dealing with forestry problems have been received from the United States Department of Agriculture. Discussing the future supply of railroad ties, Mr. H. von Schrenck, in a *Bulletin*, shows that timber of inferior quality is rendered as durable as that of a better quality by treatment with suitable preservative substances. A recent process, which is still in the experimental stage, makes use of a strong sugar solution in which the timber is boiled. With the adoption of softer timber, the method of fastening the rails requires consideration, and the respective forms of spikes, plates, and dowels are contrasted. In a *Bulletin* on the planting of white pine, Mr. H. B. Kempton compares the results obtained on four different woodlots, from which it is concluded that the expense of laying out a pure white pine plantation is considerable, but this may be reduced by planting less expensive seedlings, such as sugar maple, between, and these are cut down when thinning is required.

"A CRITICAL Revision of the Genus *Eucalyptus*" is the title of a memoir by Mr. J. H. Maiden, director of the Sydney Botanic Gardens, which has reached the fourth part. Two species, *Eucalyptus incrassata* and *Eucalyptus foecunda*, with varieties, are described and figured in a number of plates.

The extension section of the Manchester Microscopical Society has just issued an attractive list of popular science lectures (fifty-four in all) which have been arranged for delivery by its members during the coming winter. The object of the scheme is to bring scientific knowledge, in a popular form, before societies which are unable to pay large fees to professional lecturers, the work of lecturing and demonstrating being gratuitous on the part of the members.

THE Department of the Interior of Canada has recently issued a "Dictionary of Altitudes in the Dominion of Canada," by James White, the work being a supplement to that author's "Altitudes in Canada." The arrangement is alphabetical, by provinces and territories, and the volume should be of service to engineers, surveyors, and others who wish to know the altitude of any place in the dominion.

VOL. i. of the second series of the *Proceedings* of the London Mathematical Society, which has just been published by Mr. F. Hodgson, of Farringdon Street, contains obituary notices of Profs. L. Cremona, G. Salmon, J. Willard Gibbs, and Mr. G. H. Stuart, in addition to the papers read before the society from January, 1903, to February, 1904.

THE volume for 1903 of the *Journal and Proceedings* of the Royal Society of New South Wales has just reached us. It is issued in this country by George Robertson and Co., of 17 Warwick Square, E.C.

WE have received a copy of a catalogue (published by Rae Brothers, Melbourne) of the fine collection of eggs and nests of Australian birds in the possession of Mr. D. le Souëf, director of the Melbourne Zoological Gardens.

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OUR ASTRONOMICAL COLUMN.

THE RETURN OF TEMPEL'S SECOND (1873) COMET.—The comet Tempel₂ (1873), which has a period of about 5.28 years, made its last perihelion passage on July 28, 1899, and should, therefore, reappear during the later months of the present year. Although this object will be but of feeble intensity throughout the apparition, it should certainly be observable, therefore M. J. Coniel, of the Paris Bureau des Longitudes, has calculated a daily ephemeris for it from the following elements, which were computed by Mr. Schulof. This ephemeris, an extract from which is given below, covers the period July 29—October 25, and is published in No. 3962 of the *Astronomische Nachrichten*.

Epoch 1904 October 30⁰ M.T. Paris.

$$\begin{aligned} M &= 357^{\circ} 51' 49'' \\ \infty &= 185^{\circ} 44' 39'' \\ \Omega &= 120^{\circ} 59' 52'' \\ i &= 12^{\circ} 38' 55'' \\ \phi &= 32^{\circ} 50' 37'' \\ \mu &= 672'' \cdot 175 \\ \log a &= 0 \cdot 41868 \end{aligned} \quad 1904^{\circ} 0$$

In computing these elements the perturbations of Jupiter and Saturn have been taken into account.

Ephemeris 12h. (M.T. Paris).

1904		α (app.) h. m. s.	δ (app.) ° ' "	$\log \Delta$
Aug. 17	...	14 23 45	-4 9 10	0.2242
" 21	...	14 31 13	-5 17 34	0.2268
" 25	...	14 39 4	-6 26 33	0.2292
" 29	...	14 47 17	-7 35 56	0.2315
Sept. 2	...	14 55 53	-8 45 31	0.2336
" 6	...	15 4 51	-9 55 4	0.2356

SPECTRA OF NEPTUNE AND URANUS.—The results of a photographic study of the spectra of Neptune and Uranus are given in No. 13 of the Lowell Observatory *Bulletins* by Mr. V. M. Slipher, reproductions of the photographs being given on an accompanying plate.

The spectrogram of Neptune extends from λ 4300 to D, and is compared with that of the solar type star β Geminorum. There is an apparent brightening, in the planetary spectrum, on the more refrangible side of b which seems to indicate intrinsic emission, but may be due to the contrast afforded by two strong absorption bands. H β is stronger in the Neptunian spectrum, and one photograph shows H γ stronger, thereby indicating the presence of free hydrogen in the planet's atmosphere.

The spectrum of Uranus from F to λ 350 exhibits no departure from the normal solar spectrum, but on one photograph there is apparently a line in the position of D₃, indicating, if real, the presence of helium.

A comparison of the two spectra shows that although free hydrogen is present, in the atmosphere of Uranus it is not so abundant as in that of the outer planet. Three bands situated at λ 510, λ 543, and λ 577, respectively, are also stronger in the spectrum of the latter, thereby indicating that the atmosphere of Neptune is much more extensive than that of Uranus. The origins of these bands are at present unknown, unless the second and third are due to water-vapour, and Mr. Slipher suggests that they may be due to gases lighter than, but similar to, hydrogen and helium, which have not been recorded in stellar spectra because the temperature conditions in stars are, probably, unfavourably high.

THE VARIABLE RADIAL VELOCITY OF δ ORIONIS.—In a recent paper, Prof. Hartmann pointed out that the value which he obtained for the period of the "oscillations" of δ Orionis did not agree with those previously published by M. Deslandres.

The latter observer now shows, in No. 3963 of the *Astronomische Nachrichten*, that although the results are divergent the observations are confirmatory, for his result was based on very few observations, and is exactly one-third of the value obtained by Prof. Hartmann, the numbers being 1.92 and 5.73 (days) respectively. Prof. Pickering pointed out some time ago that periods of variable radial velocity which are derived from few observations are